ART. VII.—*On the Construction of an Instrument for Ascertaining the Mean Temperature of any Place. By* DR. E. DAVEY.

To ascertain the *mean temperature* of the year, and especially of particular months of the year, in different regions of the world, is an object of prime importance in Meteorology. The mean temperature of particular days is also of interest, though much less important.

The mean temperature of the year may be pretty nearly inferred from observations on the heat of the earth, at a certain distance, say ten feet, from the surface, where it is almost beyond the reach of influence from the seasons; and the results thus obtained will probably be almost exact if taken at opposite seasons of the year. By this method, however, we are informed rather of the average temperature of a succession of years, than of any particular year, and we are by no means enlightened as to the differences of the seasons.

The mean temperature of particular days may be, of course, ascertained by hourly observations on the thermometer, and taking their mean; and the temperature of the month would be calculated from the mean of the days. This method is, however, obviously too troublesome to be carried into practice.

It was remarked by Humboldt, from observations made in France, that the temperature at sun-down, is in general pretty nearly the mean of the highest and lowest of the twenty-four hours: the lowest being at sun-rise, and the highest, about two hours after noon. He preferred, however, to take the actual mean of the two extremes. These extreme points may be very exactly ascertained by means of the instrument well known as Six's day and night or register thermometer, which leaves a mark of the highest and lowest points which the thermometer has attained since the last previous observation.

The description of my sensitive thermometer pendulum has reference to the drawing. It consists of a glass tube, fixed upon any suitable frame, A being the axis of oscillation. The glass tube is bent in the form of a reversed syphon, of which each limb, but necessarily the limb G E F, is upwards of thirty-two inches in length. It contains three bulbs, of which the bulb B and part of C D down to D with the intervening tube contains air.—The remaining portion of the bulb C D and part of the bulb E F and intervening tube,

from D to E is occupied by mercury, and the remainder of the bulb E F is a Torricellian vacuum, the tube being hermetically sealed at both ends to exclude barometric influence.

The effect of heat will be to expand the air in the bulb B, and by the increase of its pressure to force the mercury out of the bulb C D into E F, the upper part of which being vacuum will offer no resistance. The weight being thus removed nearer to the centre of oscillation, will be tantamount to a shortening of the pendulum, and will cause it to vibrate more rapidly, and in exact proportion to the temperature, as it is well known that the expansion of air is uniform with every increment of temperature.

A drop of oil on the surface of the mercury in C D, and the substitution of hydrogen gas for air in B would probably add to the perfection of the instrument;—the object of the oil being to prevent the transfer of air into the vacuum, and the hydrogen to obviate the action of common air on the oil.

By a slight and obvious modification of this instrument a sensitive air thermometer may be constructed.

It is, however, obvious that the true mean temperature is not necessarily the same as the mean of the two extremes of the twenty-four hours. The thermometer may have been for many hours near its highest point, and for a short time only near its lowest, or *vice versâ*. The force of this objection becomes considerable in a climate like this, where a change of temperature to the extent of thirty degrees is not unfrequently known to occur during a single hour. Admitting, therefore, the value of Six's thermometer, as registering in a most convenient manner the extremes of heat and cold, it cannot, I think, with propriety be depended upon, as an instrument affording data from which to calculate mean temperatures, except approximately; and this approximation may be seriously remote from the exactness which modern science demands.

I now proceed to describe the principle of the instrument which I propose for ascertaining mean temperatures. It is well known that the pendulum of a clock vibrates more or less rapidly according to its length; that the pendulum is elongated by heat and shortened by cold; and consequently, that an ordinary clock has a tendency to go slower or lose time in warm weather, and to gain time in cold. The effect of slight changes of temperature upon an ordinary pendulum is very inconsiderable; but, if we can succeed in constructing a pendulum, which shall be highly sensitive of heat and cold,

to such an extent, for instance, that the variation of one degree of Fahrenheit's thermometer shall cause the clock to gain or lose five minutes a day; we shall at once have an instrument which will register the temperature of the aggregate of every vibration it has made.

Art. VIII.—*Meteorological Observations at Bendigo. By* Ludwig Becker, Esq.

In the present paper I am desirous to give the result of my observations on the weather, at Bendigo, during a period of fifteen months, viz., from the 1st December, 1852, to the 28th February, 1854. During which period I have prepared complete meteorological tables.*

During my stay at Bendigo I was unable to procure either a barometer or a thermometer, and the stated grade of temperature met with in the tables was kindly furnished to me by a gentleman who was fortunate enough to have been in possession of the necessary instruments.

My especial object in preparing these meteorological tables is, that in connection with, and compared to, later observations, it should tend to fix the character of the seasons and their phenomena.

So far as I have had the opportunity of observing the character of the weather at Bendigo, I have come to the following conclusions:—

1. Prevailing winds come generally from N. W., most of the rain coming from the same quarter.

2. During the day there is more or less wind, followed by a calm and clear night.

3. Warm days and hot winds are generally succeeded in the evening by a cold southerly wind, as if the effect of the sea breeze extended as far inland as Bendigo.

4. The hot winds announce themselves in the morning by a thick hazy atmosphere, with a light south-easterly breeze; the wind, increasing in force, veers from south-east to east, and gradually wears round to the north-west, which ends in a cold south wind, *thus making a perfect circle;* the greatest heat is felt when the wind is blowing from the north-west; the hot wind is generally followed by rain.

5. The whirlwinds prevailing during fine weather and gentle breezes, but do not indicate rain.

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* The original meteorological tables are deposited in the Museum of Natural History.